O 78: Overview Talk Manish Garg

Time: Thursday 9:30–10:15 Location: H24

Topical Talk O 78.1 Thu 9:30 H24

Imaging Electronic and Atomic Motion in Molecules — •Manish Garg — Max Planck Institute for Solid State Research, Heisenbergstrasse 1, Stuttgart 70569

The capability to capture electronic and atomic motions at their natural length (Ångstrom-scale) and time-scales (attoseconds to femtoseconds) is a long-standing goal in modern science. In my talk, I will show you how electron dynamics in molecules can be locally probed with angstrom-scale spatial resolution and sub-femtosecond temporal resolution simultaneously, at the single orbital-level with the help of a scanning tunnelling microscope (STM), defying the previously established fundamental space-time limits [1-3].

Quantum decoherence of the excited electronic states and dipole-dipole interactions between molecules can now be imaged in real-space and real-time. We have recently imaged electronic excitation transfer dynamics between donor and acceptor kind of molecules. Excitons locally excited in a donor molecule exchanges energy by coherent dipole-dipole interaction with a neighboring acceptor molecule [4].

Atomic motions in a single molecule can be directly imaged by realizing coherent anti-Stokes Raman spectroscopy in an STM [5-8]. These recent developments pave the way towards direct real space-time imaging of chemical reactions and phase transformations in two-dimensional materials.